



Modeling Numbers












You can model whole numbers using place-value blocks.

Use  to move blocks.

Workspace: One-Pane Workspace



Practice Using Place-Value Blocks

1. Click . Place one large cube in the workspace for each thousand in the number being modeled. Use 4 .
2. Click . Place one flat in the workspace. For each hundred in the numbered being modeled. Use 3 .
3. Click  or . Place one long (either horizontal or vertical) in the workspace for each ten in the number being modeled. Use 7 .
4. Click . Place one small cube in the workspace for each one in the number being modeled. Use 2 .
5. Select the Thousands, Ones Place-Value Chart from the Options menu. Notice that the blocks in the workspace are positioned in the proper columns. Click  to turn the tabulator on and show the standard form of the number: 4,372.
6. Click  to display different ways of naming that number.

Step by Step 1



Step 4



Step 5





Comparing Numbers

Step by Step 2



You can compare numbers using place-value blocks.

Workspace: Three-Pane Workspace




A yellow border indicates the active pane of this workspace.






Practice Using Place-Value Blocks

1. Place blocks in the upper workspace to represent a number having digits in the thousands, hundreds, tens, and ones places. Use 1,381.

Place 1 . Place 3 . Place 8 . Place 1 .

Click  to turn the top tabulator on and check that it shows 1,331.






2. In the middle pane show a number that is 100 more than 1,381.

Use  and drag a rectangle around all the blocks in the upper pane. Click . Click  on any block outlined in red. This will copy all of the selected blocks. Click . Select one of the blocks with a red outline and drag the group into the middle pane. Place one more  in the middle pane to add 100 to 1,381.

Turn the middle tabulator on and check that it shows 1,481.

Step 2



3. In the bottom pane show a number that is 50 less than 1,481.
Select and copy the blocks in the middle pane. Move the copied blocks into the bottom pane. Use  to draw a rectangle in the empty space to deselect the blocks in the bottom pane.
- Use  to take away 50. Click  on five .
- Click  to turn the bottom pane tabulator on and check that it shows 1,431.
4. Look at the tabulators in the three panes.

Step 3





Adding Numbers

Step by Step 3






You can add numbers using place-value blocks. Use  to rename as needed.

Workspace: Two-Pane Workspace











Practice Using Place-Value Blocks

1. Place blocks in the upper pane to represent the first addend. Use 192.

Place 1 . Place 9 . Place 2 .

2. Place blocks in the lower pane to represent the second addend. Use 548.

Place 5 . Place 4 . Place 8 .

3. Click  to turn on each tabulator. Note the values in all three tabulators.
4. In the Options menu, choose Hundreds, Ones to see the place-value chart for the blocks in both panes.
Note the columns that have 10 or more blocks. Choose No PV Chart in the Options menu.
5. Click . Use  to move all of the  and  from the lower pane to the upper pane.




Step 3






Step 5



6. Click . Rename blocks in the upper workspace.

Click the  on 10 . Notice they were replaced with a .

Click the  on 10 . Notice they were replaced with a .

7. In the Options menu, choose the Hundreds, Ones place-value chart. Notice the blocks in the place-value chart match the numbers of the sum in the tabulator.




Subtracting Numbers

You can subtract numbers using place-value blocks.

Workspace: Two-Pane Workspace







This workspace provides an automatic check system.

Use  to rename as needed.

Practice Using Place-Value Blocks

1. Show the minuend in the upper pane of the workspace. Use 3,046.

Place 3 . Place 0 . Place 4 . Place 6 .

















Check that the upper tabulator shows 3,046.

Step by Step 4



Step 1



2. Use  to select and move blocks that equal the subtrahend into the lower workspace. Use 819 for the subtrahend. You need to move 9  into the lower workspace. Because you only have 6 , use  to rename a .
- Click . Click and drag a rectangle area around 9  to select them, then move them into the lower pane.
- Use  to select, and move 1  into the lower pane.
- You need to move 8  into the lower pane. Because you have 0 , use  to rename a .
- Use  to drag 8  into the lower pane.
3. The tabulator in the upper pane shows the difference.  The tabulator in the lower pane shows the subtrahend. The tabulator along the top of the screen shows the minuend. The subtraction problem solved is $3,046 - 819 = 2,227$.



Modeling Decimals

You can use a place-value blocks to model decimals.

Place Value Chart: Thousands, Ones




Use place-value charts in the options menu to choose the unit block. The values of the other blocks change accordingly.

Practice Modeling Decimals





1. Place blocks in the workspace to represent any number. Use 2,573.

Place 2 . Place 5 . Place 7 . Place 3 .

Click  to see the blocks automatically separate by place value.

Click  to see the number displayed: 2,573.

2. In the options menu, choose the Ones, Thousandths workspace.

Now a  equals one, a  equals one tenth, a  equals one hundredth, and a  equals one thousandth.
The Tabulator now reads 2.573.

Step by Step 5



Step 1



Step 2





Counting On and Back by 1 and 2

Step by Step 6


TOOLS 4 MATH

You can act out the process of adding 1 or 2 more.
You can also act out the process of subtracting 1 or 2.

Workspace: Small Number Line



Practicing Counting On and Counting Back

1. Start with 5. Use  to click the dot above 5 on the number line. The worm jumps to number 5.
2. Count on by 1. $5 + 1 = 6$. Click the dot above 6.
3. Count on by 2. $6 + 2 = 8$. Click the dot above 8.
4. Now count back by 1. $8 - 1 = 7$. Click the dot above 7.
5. Notice the different color jumps. The jump appears in black when you are counting on or adding. The jump appears in red when you are counting back or subtracting.

Step 2




Step 4





Making Ten







You can use a Ten-Frame to teach the addition strategy *making ten*.

Use  to move counters around the workspace.

Workspace: One-Pane Workspace



Practice Using Ten-Frames

1. In the Options menu, choose the One Ten-Frame workspace. Choose one color and then place 7  in the ten-frame.
2. Place counters in the open squares in the ten-frame. Choose a different color and then place one  in each of the 3 open squares. Notice the tabulator shows 10. The ten-frame shows $7 + 3 = 10$.
3. Use counters and a ten-frame to find a sum. Click  to clear the workspace. Use $6 + 8$ for the addition problem.
4. Represent the first addend in a ten-frame. Place one  in each of 6 open squares.
5. Place counters for the second addend. Fill the ten-frame first. Place one  in each of the 4 open squares. You have only placed 4 of the 8 counters needed for the second addend. Place 4  in the workspace outside of the ten-frame.
6. By looking at the workspace and the tabulator, you can see that $6 + 8 = 14$.

Step by Step 7

TOOLS  MATH

Step 1




Step 6





You can use Ten-Frames and the copy





tool to model multiplication.

Use  to copy groups of counters.

Workspace: Two Ten-Frames



Practice Using Counters




1. Click  to turn the tabulator on.
2. Place one of the addends of a repeated addition problem in the ten-frame. Use the addends 3 and 6. Place 3 counters.
Pick any color and then click . Click in the left ten-frame to place one counter. Click in the left ten-frame two more times.
3. Choose a different color and place another set of 3 counters in the ten-frame. Repeat placing sets of 3 counters until you have placed 6 sets in all. When the first ten-frame is full, place counters in the second ten-frame.
4. The ten-frames show 10 and 8 more. The tabulator shows 18. The problem solved is $3 + 3 + 3 + 3 + 3 + 3 + 3 = 18$.
5. In the Options menu, choose the basic workspace. Click  to clear the workspace. Click . Place 3 counters in the workspace.

Step by Step 8



Step 3



6. Click . Click and draw a rectangle around the 3 counters. Notice that the counters are now outlined in red.
7. Click  to make a copy of the selected counters.
Click the  on one of the counters in the selected set.
Continue to click, each time on a counter in the newest set, until you have 6 sets.
8. The workspace shows 6 sets of 3, or 6×3 . The tabulator shows 18.

Step 7





Multiplication Arrays





You can model multiplication and division facts using arrays. You can also find common factors for two or more numbers.

Workspace: Click and Drag Array

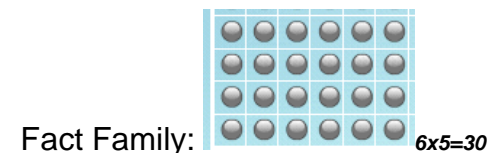


Click and hold the upper right corner of the array box and drag to resize an array. The numbers shown in the multiplication sentence are factors of the number in the tabulator.

Practice Using the Array Workspace

1. Click  and drag to show a multiplication fact. Show 6 columns of 5 rows. The multiplication facts illustrated are $6 \times 5 = 30$ and $5 \times 6 = 30$. The related division facts are $30 \div 6 = 5$ and $30 \div 5 = 6$. Each time you change the size of the array you display a fact family.
2. Click  and drag to show one column of an array that has the number whose multiples you want to name. Use a 1×7 array.
3. Click  and drag one unit right. Do not change the vertical factor of 7. With each unit-change, you step through the multiplication facts for 7. The tabulator shows the multiples of 7 one at a time.
4. Click  and drag to find arrays that show the same product. Use 12. Set the vertical factor at 2 and drag right until 12 shows in the tabulator. Note the fact $2 \times 6 = 12$.

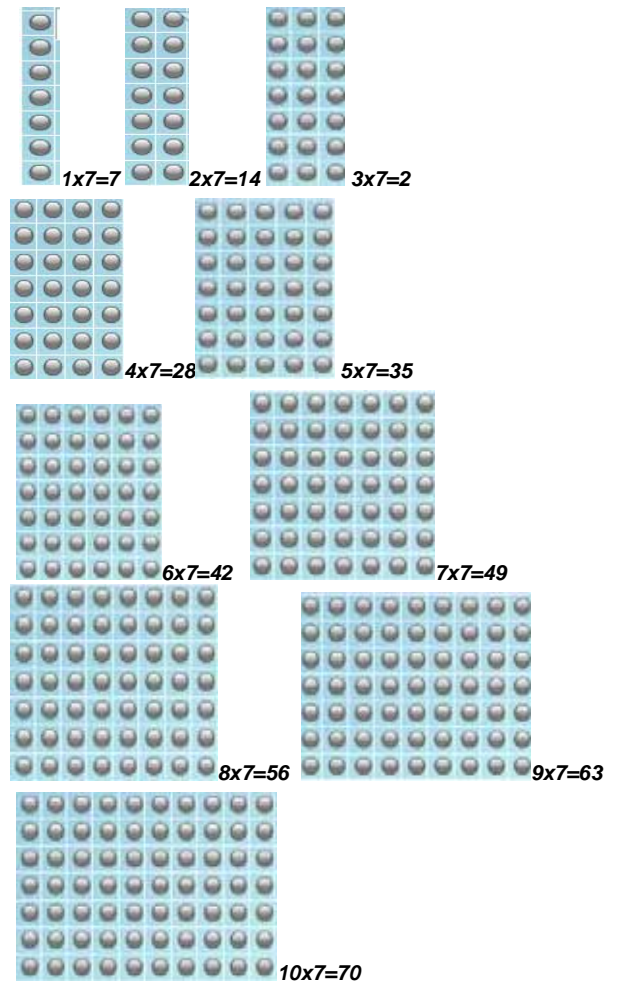
Step by Step 9



Repeat by increasing the vertical factor by 1 until all facts are named. Note the other facts are $4 \times 3 = 12$ and $6 \times 2 = 12$.

5. Repeat Step 4 using a second number. Find the arrays for 18.
You will find facts $2 \times 9 = 18$, $3 \times 6 = 18$, $6 \times 3 = 18$ and $9 \times 2 = 18$
Move the vertical factor to 3 and drag to find the fact $3 \times 4 = 12$.
6. Compare the facts named in Steps 4 and 5. Common factors of 12 and 18 are 2 and 6.

Multiples of 7:





Equivalent Money Amounts

You can find different combinations of bills and coins that equal the same amounts.

Workspace: Two-Pane Workspace



Use and to exchange money.

Use when you want to arrange the displayed money from greatest to least.

Use to view different formats for writing the amount.

Practice Using Money

1. Click once in each pane of the workspace and once at the top of the screen to turn the tabulators on.

Click . Place \$1 in each pane of the workspace. Notice the tabulators show \$1.00.

2. In the lower pane, use to exchange money.

Click the on the \$1. Notice the exchange to 4 quarters.

Click the on 2 quarters. Click the on 4 dimes. Use to move the coins as needed for better viewing.






Notice the tabulator still shows \$1.00. So, \$1 is the same as 2 quarters and 10 nickels.

Step by Step 10



Step 2



3. In the lower workspace, use  to exchange money.
Click the  on 2 quarters. Notice the exchange to a half-dollar.
Click the  on 2 nickels. Repeat until all nickels are exchanged.
4. The amount shown in each tabulator is still \$1.00. So, \$1 is the same as one half-dollar and 5 dimes.
5. Click  to see the amount written in words. Click  again for the amount as cents.

Step 3





Making Purchases and Change

You can represent the change received from a purchase and show how the sum of the price and the change received equals the amount used to make the purchase.

Workspace: Two-Pane Workspace



Use and to move and exchange money. Use to display the money from the greatest value to the least value.

Practice Using Money

1. In the upper pane show the amount used for a purchase. Use \$15.

Click . Place one \$10 bill.

Click . Place one \$5 bill.

2. Place the amount of the purchase in the lower pane. Use \$12.23.

Click . Drag the \$10 from the upper pane to the lower one.

In the upper pane, use to exchange money.

Click the on the \$5 bill. Click the on a \$1 bill. Click the on a quarter.

Click the on the nickel.

3. Click . Drag money into the lower pane until the amount totals \$12.23.
4. The upper tabulator shows the change received. The lower tabulator shows the price of the purchase. The tabulator along the top shows the money used to make the purchase.

$$\$2.77 + \$12.23 = \$15.00$$

Step by Step 11



Step 2



Step 3





Modeling Decimals with Money

Step by Step 12



You can model decimal numbers using money.

Workspace: One-Pane Workspace



Use the bill or coin that corresponds to each place value.



Practice Using Money

1. Model a number that has digits in the hundreds, tens, ones, tenths, and hundredths places. Use 532.64.

Click . Place five \$100. Notice that the tabulator shows \$500.00.

Click . Place three \$10. Notice that the tabulator shows \$530.00.

Click . Place two \$1. Notice that the tabulator shows \$532.00.

Click . Place six dimes. Notice that the tabulator shows \$532.60.


Click . Place four pennies. Notice that the tabulator shows \$532.64.


2. Each group of money represents an addend in the expanded form of the number.

$$500 + 30 + 2 + 0.6 + 0.04 = 532.64$$

Step 1



3. Click  to display the number in word form.

five hundred thirty-two dollars and sixty-two cents 

4. For the word form without the reference to money, in your mind remove *dollars* and replace *cents* with *hundredths*.

Five hundred thirty-two and sixty-four hundredths



Adding Decimals Using Money

Step by Step 13

TOOLS 4 MATH

You can use money as a model when adding decimal numbers.

Workspace: One-Pane Workspace



Use bills for whole numbers and coins for decimals.
Place bills and coins so that the addends are separated.

Use  to exchange when necessary.




Practice Using Money


1. Model one addend. Use 140.32.

Click . Place one \$100. Click . Place four \$10. Click .

Place three dimes. Click . Place two pennies.

2. Model the other addend. Use 64.84.

Click . Place six \$10. Click . Place four \$1. Click .

Place eight dimes. Click . Place four pennies.


3. The tabulator shows the sum.


\$205.16 


Step 2




4. Exchange any amount with ten or more so that the workspace models the sum shown in the tabulator.

Click the  on ten dimes. Notice that the ten dimes become two half dollars.

Click the  on the two half dollars. The two half dollars become \$1.

Click the  on ten \$10. Notice that the ten \$10 become five \$20.

Click the  on five \$20. The five \$20 become \$100.

The addition problem solved is $140.32 + 64.84 = 205.16$.

Step 4





Subtracting Decimals Using Money

Step by Step 14


TOOLS 4 MATH


You can use money as a model when subtracting decimal numbers.

Workspace: One-Pane Workspace



Use bills for whole numbers and coins for decimals.

Use  to exchange money when necessary.

Use  to take away money.



Practice Using Money



1. Model a number. Use 52.81.

Click . Place five \$10. Click . Place two \$1. Click .

Place eight dimes. Click . Place one penny.

2. Subtract a smaller number. Use 17.45. Begin subtracting with the hundredths, 0.05.

You need five , you only have one. Click the  on a dime.

Click the  on one nickel. Click the  on five pennies.



3. Subtract the tenths (0.40).


Click the  on four dimes.

Step 3




4. Subtract the ones (7).

You need seven . You only have two. Click the  on a \$10.

Click the  on one \$5 and two \$1.

5. Subtract the tens (10).

Click the  on one \$10.

6. The tabulator shows the difference.

The subtraction problem solved is:

$$52.81 - 17.45 = 35.36.$$

\$35.36 

Step 4





Multiplying Decimals Using Money




Step by Step 15

TOOLS **4** MATH

You can use money as a model when multiplying a decimal by a whole number.


Workspace: One-Pane Workspace









Use bills for whole numbers and coins for decimals. Use  to select and move money. Use  to copy selected money. After copying, use  to exchange money.

Practice Using Money

1. Model the factor that is a decimal number. Use 3.75

Click . Place three \$1 in the workspace.

Click . Place seven dimes. Click . Place five pennies.

2. Click . Click and drag a rectangle around your model to select all of the money in the workspace.
3. Move the selection to the upper left corner of the workspace.
4. Use  until the number of sets matches the whole number factor. Use 4 for the whole number factor.
Click . Click on the selected money. Click on the selected money again to create a third set. Repeat to create the fourth set.
5. Click  to arrange the money for easier viewing.

Step 3




Step 4




6. Use  to exchange any amount.

Click  on ten pennies. Repeat with ten more pennies.

Click  on two nickels. Repeat with two more nickels.

Click  on ten dimes. Repeat with ten more dimes until there are no dimes remaining.

Click  on two half-dollars. Repeat with two more half dollars until there are no more half dollars remaining.

Click  on ten \$1. Then click  on two \$5.

The multiplication problem solved is $3.75 \times 4 = 15.00$.



Dividing Decimals Using Money

You can use money as a model when dividing a decimal by a whole number.

Workspace: Two-Pane Workspace





Use bills and coins to model the dividend. Use  to select and move money.

Use  to exchange money in the upper workspace.


Practice Using Money



1. In the upper pane model the dividend. Use 13.80.


Click . Place one \$10. Click . Place three \$1.



Click . Place eight dimes.

2. Create equal groups in the lower pane. The number of groups is the divisor. Use 3 as the divisor.

Click . Drag three \$1 into the lower pane. Position them into 3 distinct groups. Drag two dimes from the upper pane into each group.

3. Use  to exchange the \$10 in the upper pane. Then use  to exchange two \$5 in the upper workspace.

4. Click . Drag three \$1 into each group in the lower pane.




5. Use  to exchange the \$1 in the upper workspace. Use  to exchange 4 quarters in the upper pane.

Step by Step 16



Step 4



6. Click . Drag four dimes into each group in the lower pane. Click  to exchange 4 nickels for 2 dimes.
7. Notice that the tabulator in the lower workspace is now the dividend.
8. Click . Click and drag a rectangle around one group in the lower pane. Move that group into the upper pane.
9. The tabulator in the upper pane shows the quotient. The very top tabulator now shows the dividend.



Step 8





Reading Analog Clocks

You can set an analog or a digital clock and see the time represented in both ways.

Workspace: Time Workspace







Use the analog and digital clocks together in the workspace.

Set the analog clock to a time and the digital clock will adjust to show that time in numbers.

Set the digital clock and see the hands on the analog clock move to show that time on the clock face.

Practice Using Clocks

1. Click on the minute hand (red) of the analog clock. When you move that hand, the other hand moves as well. Move the hands around the clock to a desired time. Use 7:15.
Be sure the minute hand (red) is pointing to the 3 and the hour hand (blue) is pointing between the 7 and 8.
Notice the digital clock changes to show 7:15.
2. Click the left red button (hour) on top of the digital clock.
Click  or  to change the hour. Change the hour to 3. Click the hour button again to set the time.
3. Click the middle red button (minute) on top of the digital clock.
Click  or  to change the minutes. Change the minutes to 48. Click the minute button again to set the time.
Notice that the time on the analog clock changes to show 3:48.

Step by Step 17

TOOLS 4 MATH

Step 1



Step 3





Computing Elapsed Time







Elapsed time is computed as Ending Time minus Starting Time.

Workspace: Set and Explore Workspace



Use analog clocks in the Set and Explore workspace to set the starting and ending times and find elapsed time.

Practice Using Clocks

1. Set the Starting Time.
To set the starting time, move the hands on the left clock around the clock. Set the Starting Time to 7:10 A.M.
If needed, click on AM or PM on the clock to set it properly.
2. Set the Ending Time.
Move the hands on the right clock around the clock. Set the Ending Time to 9:32 A.M.
If needed, click on AM or PM on the clock to set it properly.
3. Click  to find the Elapsed Time. Click  to show the elapsed time of 2 hours and 22 minutes. 
4. Choose a Starting Time and an Ending Time. Set each to find the Elapsed Time. Use 11:25 A.M. for the Starting Time. Use 3:50 P.M. for the Ending Time.
Click  to find the Elapsed Time.
5. Click  to show the elapsed time of 4 hours and 25 minutes. 

Step by Step 18

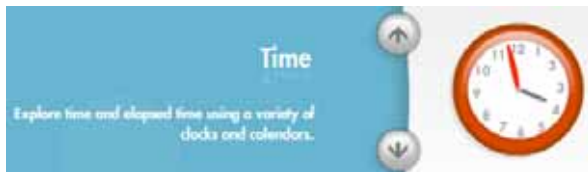


Step 3



Step 5

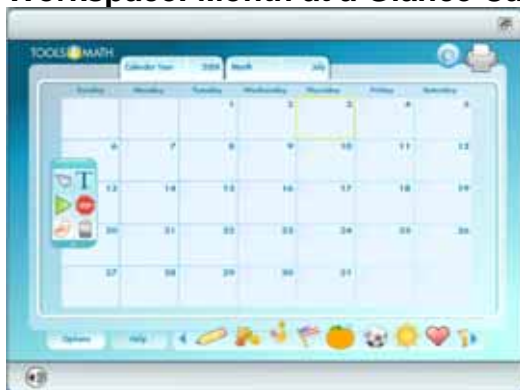




Reading a Calendar

You can mark events on a calendar and count the number of months, weeks, and days in a given time period.

Workspace: Month at a Glance Calendar Workspace




Use the calendar year tab to select a year. Use the month tab to select a month.



Practice Using a Calendar

1. Select a month and year. Choose June 2006.
2. Record June 14 as the last day of school.

Click on . Then click on June 14 at the top.



Click  and click on the date where you want to enter text. Type "School is out."

3. Enter soccer practice on June 16 and June 20.


Click on . Then click on June 16 at the top. Click  and type "Soccer practice."

Repeat for June 20.

4. Suppose the June 16th practice is canceled.

Click  and click on the soccer ball. Then click  and point to June 16. Press the delete key on your keyboard.

5. On June 20, you have a party to attend before your soccer practice.

Click on  and add it to June 20.

Step by Step 19



Step 3



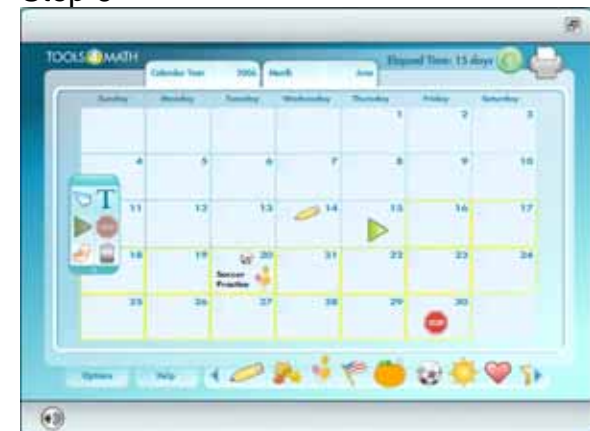
6. Count the days between the last day of school and the first day of summer camp. Summer camp starts on June 30.

Click . Click on June 15.

Click . Click on June 30.

Click the tabulator to show the elapsed time is 15 days.

Step 6





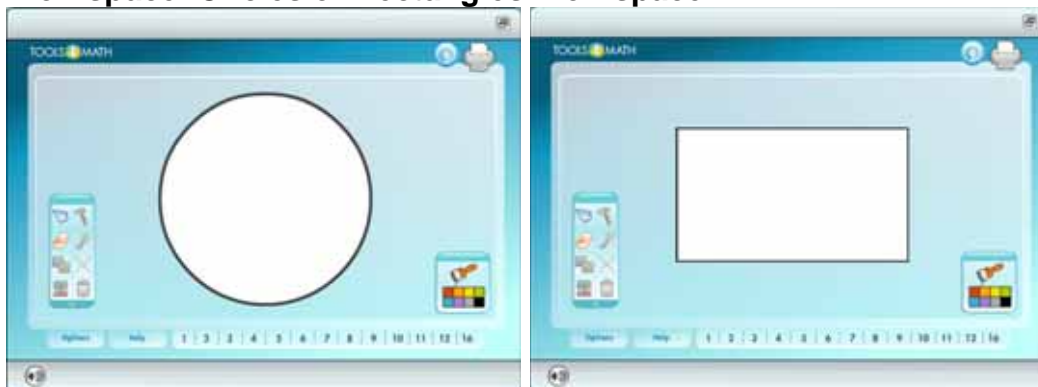
Modeling Fractions Less Than 1

Step by Step 20



TOOLS **4** MATH

You can model a fraction using the shapes to shade workspace with wedges and strips.



Workspace: Circles or Rectangles Workspace



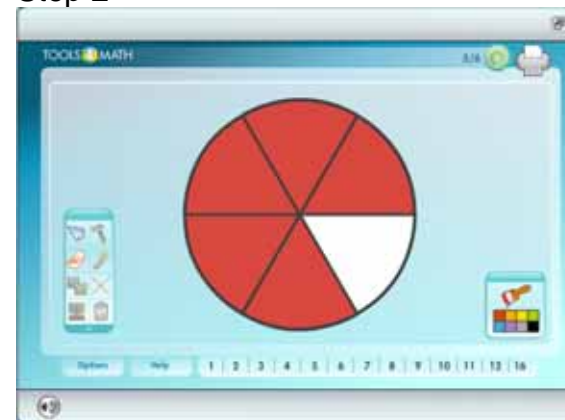
Model fractions that have a denominator of 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, or 16.

Use  to shade a wedge or strip and  to clear the shading from a wedge or strip.

Practice Using Fraction Models

1. Choose a denominator for the fraction that you want to model.
Select from the denominator menu. Select 6.
Notice the circle is now separated into six equal wedges.
2. Shade wedges to represent the numerator for the fraction that you want to model.
Choose a numerator. Use 5.
Click  inside 5 of the 6 wedges to represent the numerator.
Notice the tabulator shows $\frac{5}{6}$ as "5/6."
3. Click  to see the word form of $\frac{5}{6}$ inside the tabulator. Click twice more to see it as a decimal and again to see it as a percent.

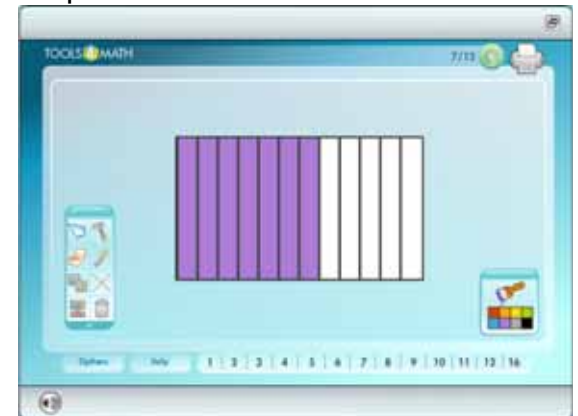
Step 2



4. Use the rectangle shape to model a fraction. The process is the same as those used in Steps 1–3.

The fraction modeled at the right is $\frac{7}{12}$.

Step 4





Modeling Equivalent Fractions

You can find equivalents of fractions using the compare fractions workspace with wedges or strips.

Workspace: Fraction Wedges or Strips Workspace




In the workspace, the active pane is indicated by a yellow border.

Practice Finding Equivalent Fractions

1. Model a fraction in the left workspace. Use $\frac{1}{2}$.





Use  and click in one of the circles.

2. Find an equivalent fraction in the right workspace. Click inside the right workspace. Notice the yellow border.

Think of multiples of 2 to use for a denominator. Use $\frac{1}{4}$.



Click  and click in one of the circles to place wedges until  appears between the two workspaces.

Click  in the left and right workspaces to name the equivalent fractions.


Step by Step 21





Step 2



3. Find another fraction equivalent to $\frac{1}{2}$.

Click  and click on the 2 wedges in the right workspace.

Click  to place wedges in the circle until  appears between the two workspaces.

4. Find more fractions equivalent to $\frac{1}{2}$ using the fraction strips workspace.

Repeat Steps 1–3 using , , and .

Step 3





Comparing Fractions Less Than 1




You can compare fractions less than 1 using the compare fractions workspace with wedges or strips.

Workspace: Fraction Wedges or Strips Workspace



In the workspace, the active pane is indicated by a yellow border.

Practice Comparing Fractions with the Same Denominator

1. Model one of the fractions to compare in the left pane. Use $\frac{7}{10}$.
Click  and click in one of the circles 7 times to represent $\frac{7}{10}$.
2. Model the second fraction to compare in the right pane. Use $\frac{3}{10}$.
Click inside the right pane. Notice the yellow border.
Click  and click in one of the circles 3 times to represent $\frac{3}{10}$.
Notice  between the panes.
The model shows $\frac{7}{10} > \frac{3}{10}$.

Step by Step 22





Step 2



Practice Comparing Fractions with Different Denominators

3. Repeat Steps 1 and 2, but model $\frac{4}{5}$ in the left workspace and $\frac{5}{6}$ in the right workspace.

Click  and click in one of the circles four times in the left circle to represent $\frac{4}{5}$.

Click  and click five times in the right circle to represent $\frac{5}{6}$.

Step 3





Fraction Sums Less Than 1

Here is a way of adding fractions with unlike denominators when the sum is less than 2 and when the common denominator is 12 or less.

Workspace: Fraction Wedges or Strips Workspace





In this workspace, the active pane is indicated by a yellow border.


Practice Comparing Fractions

1. In the left workspace, model a fraction consisting of two pieces with different denominators. Use $\frac{1}{2}$ and $\frac{1}{3}$.



Click  and click in the left circle. Then click  and click again in the same circle.

2. In the right workspace, make an equivalent fraction with unit fractions of the same denominator. Click inside the right workspace. Notice the yellow outline. Decide what you think the common denominator should be. (If you don't know, look at the tabulator.)

Click  until  appears between the two workspaces.

3. Click on the  to clear both workspaces. Then try showing the sum of $\frac{2}{5} + \frac{3}{10}$.

Step by Step 23



Step 1



Step 2













Parts of a Set

Workspace: Objects or Shapes



Practice Using the Objects Workspace

1. Use  to select the . Click in the workspace ten times to place ten .
2. Click  and select red. Paint three bears red.
3. Select green with . Paint two bears green.
4. Select blue with . Paint the five remaining bears blue.
What fraction of the objects are red?
What fraction of the objects are green?
What fraction of the objects are blue?
5. Add two more  to the workspace and use  to color them green.
Now what fraction of the objects are red? Green? Blue?

Step by Step 24



Step 3



Step 5





Fraction Sums



You can add fractions that have a denominator of 1, 2, 3, 4, 5, 6, 8, 10, or 12.

Workspace: Circles or Rectangles (1-4)





Practice Using the Rectangles Workspace

1. Place fraction pieces in the workspace.

Click , then click .


Notice that the Tool4Math finds the least common denominator and displays the sum in the tabulator, which now reads "5/6."

Click . Now you have made $\frac{6}{6}$, or 1 whole.

Click on  to switch back and forth between improper fractions, word form, simplest form, decimals, and percents.

2. Continue to add fraction pieces to the workspace.

Click  five times. Click  three times. Click  twice.

Notice the tabulator. As you go along, click  to see improper fractions, word form, simplest form, decimal, and percent representations of the pieces.

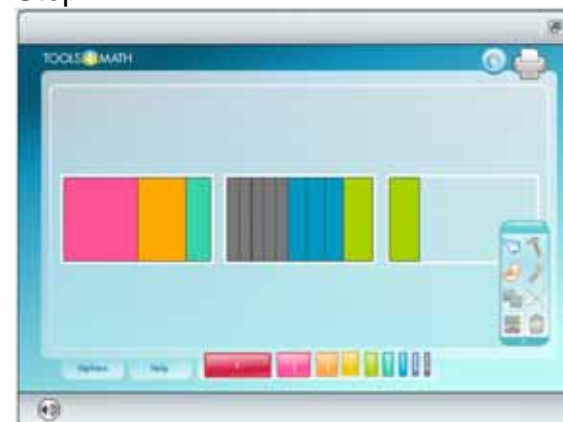
Step by Step 25



Step 1



Step 2





Common Denominators



















Step by Step 26

TOOLS 4 MATH

Workspace: Fractions



Practice Using Common Denominators

1. Use  to place one  block and four  blocks in the workspace.
2. Use  to combine all  blocks. Now you have three  blocks.
3. Now add four  blocks to the workspace.
4. Use  to combine the  blocks. Now you have three  blocks and two  blocks.
5. Use  to combine the  blocks. Now you have four  blocks.
6. Use  to combine the  blocks. Now you have one  block and one  block. This represents the mixed number $1 \frac{1}{3}$.

Step 3



Step 6





Simple Probability with Coins

You can conduct a simulation of flipping a coin. You can then compare the results of the simulation to the probability of flipping any standard coin.

Use the One Coin Workspace to experiment with the Coin tool.

The probability and results automatically appear when the tabulator is turned on.

Workspace: One Coin



Practice Probability Using Coins

1. Click . Notice the possible outcomes are shown in the Event column of the table.
2. Conduct a simulation of flipping a coin twice.
Click once. Watch as the coin is flipped and the result recorded as a tally in the appropriate row.
Because the flips of a simulation are random, our results, and therefore your screen, may not match the one shown at the right.
Click again. Watch as the coin is flipped and the result recorded as a tally in the appropriate row.
To match theoretical probability, the coin would land once with heads up and once with tails up.
3. Click to clear your current results.


Step by Step 27



Step 2



4. Conduct a simulation of flipping a coin 100 times.

Click in the Number of Tosses box. Type 100. Click .

You will only see the coin flipped once, but the simulation will show results of 100 flips.

Remember your screen may not match the screen shown below.

To match theoretical probability, the results would be 50 heads and 50 tails. In most cases, each will be close to 50, but not exactly 50.

Step 4





Simple Probability with Spinners

You can conduct simulations with spinners. You can also investigate the probabilities of each spin.

Because the spins of a simulation are random, your results, and therefore your screen, may not match the results in this activity.

Workspace: One Spinner and Two Spinners



Practice Probability Using Spinners

1. Click on the spinner, then click until there are four sections. Select so that each section is labeled.
2. Conduct a simulation of spinning four times.

Click to turn the tabulator on. Click four times. Watch as the pointer lands on a section and the results are tallied in the appropriate row.

To match theoretical probability, the pointer would land once on each section.

3. Now select the Two Spinner workspace from the Options menu.
4. Conduct a simulation where you spin a two-section spinner and a three-section spinner 12 times.

The spinner on the left is already set as a two-section spinner. Click the spinner on the right, then click once to make it a three-section spinner.

Click to turn the tabulator on, then click in the Number of Spins box.

Type 12 and click .

Compare your results to the probability column.

Click the slider at the right of the table to see all of the results.

Step by Step 28

TOOLS 4 MATH

Step 2



Step 4





Simple Probability with Cubes

You can conduct a simulation of tossing one cube or two cubes. You can then compare the results of the simulation to the probability of tossing one cube or two.


Workspace: One Cube



Practice Probability Using Cubes

1. Notice the labels for sides of the cube are shown along the bottom of the screen. These can be changed from letters to numbers to shapes.
2. Conduct a simulation of tossing a cube six times.

Turn the tabulator on. Click in the Number of Rolls box. Type 6. Click **Go**.
To match theoretical probability, the cube would land once with each side up.

3. Click  to clear your current results.
4. Conduct a simulation of tossing a cube 60 times.

Click inside the Number of Rolls box. Type 60. Click **Go**.

The cube was tossed more times, so the results should be closer to the theoretical probability than in Step 2.

5. Conduct a simulation of tossing a cube 600 times.

Clear your results. Type 600 in the Number of Rolls box. Click **Go**.

Because the cube was tossed even more times, the results should be even closer to the theoretical probability than in Step 4.

Step by Step 29



Step 2



Step 4





Simple Probability Using Marbles

You can conduct a simulation of drawing marbles from a jar and study the resulting probabilities.

Turn the tabulator to display the results automatically.

Workspace: One Jar Jumbler Machine



Practice Using Marbles with Replacement

1. Make sure Replace Draw is set to , so the marbles will be replaced. Select one color, then click the marble. Click inside the jumbler to place nine marbles in the jar. Choose another color and put one more marble in the jar.
2. Conduct a simulation of drawing a marble from the bag five times. Click . Watch a marble come from the bag. Note that the result is recorded in the table and the marble is put back into the bag. Notice the probability does not change. Click four more times. Note a marble of the first color is most likely to be drawn because there are always eight more in the bag.
3. Click . Click to clear results.

Step by Step 30



Step 2



4. Conduct a simulation of drawing from a bag with two colors of marbles, 5 of each color.

Change the number of each color of marble to 5.

Click inside the Number of Draws box to place the cursor. Type 100. Click [Go](#).
Your results will show that both colors of marble was drawn more than 5 times.
This is possible because the marbles are replaced after each draw.

Step 4





Simple Probability Using Marbles

You can conduct a simulation of drawing marbles from a bag and study the resulting probabilities. You choose if the simulation allows replacement of the marbles after each drawing.

Workspace: One Jar Jumbler Machine



Practice Using Marbles without Replacement

1. Turn Replace Draw on and turn Auto-fill on. Select a color and then select the type of object. Click in the jar to place ten of the same object.
Click . Watch a marble come from the jar as the result is recorded in the table. Notice the probability changed.
Click seven more times. Notice the changes in the table.
3. Click . Click to clear results
4. Conduct a simulation of drawing from a jar with three colors of marbles, two of each color.
Turn Replace Draw Off. Add two marbles of three different colors.
Click . Notice where the result is recorded. Continue drawing until one color has a probability of 0.
5. After conducting this simulation several times, you can learn that the least number of draws to empty the jar of one color is two, and the greatest number of draws to empty the jar of one color is four.

Step by Step 31

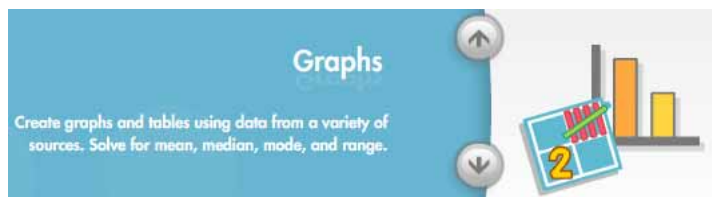
TOOLS MATH

Step 2



Step 5





Data and Tables

You can format and sort data that you enter in a table and calculate the mean, median, and mode of numerical data.

Workspace: Graphs



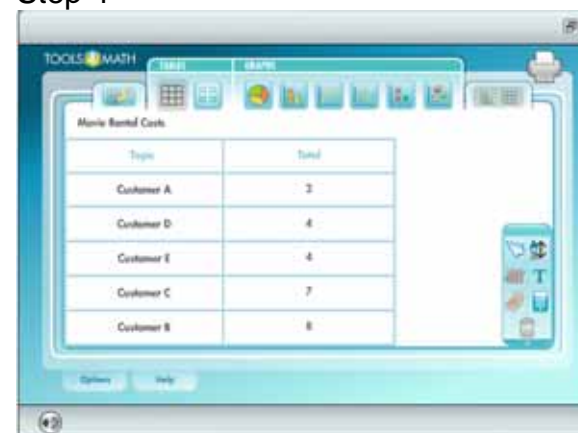
Practice Using a Data Table

1. Click . Use the slider to increase the number of rows to five. Click Ok.
2. Use the Text Entry tool to enter the graph title: Movie Rental Costs.
3. Use the Text Entry tool to enter the following data in the Topic column of the table: Customer A, Customer B, Customer C, Customer D, and Customer E. Enter the following data in the Total Column of the table: 2.00, 8.00, 7.00, 4.00, and 4.00.
4. Sort the data in ascending order.
Use the to highlight all the cells in the Total Column. Click and then click on one of the highlighted cells. The data is in ascending order.
5. Calculate the mean. Select .
Add all the values and divide by 5. This is the mean.
6. Calculate the median. The median is the middle number when the numbers in a data set are listed in order. Since the data is already in order, find the middle number. This is the median.
7. Calculate the mode. Find the number that occurs most often. This is the mode.

Step by Step 32

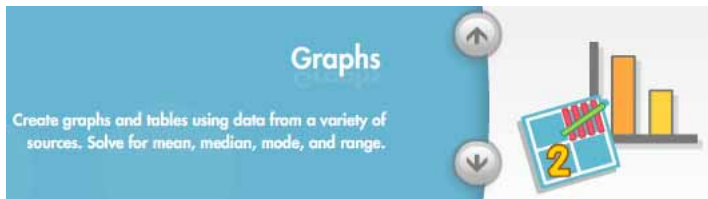
TOOLS 4 MATH

Step 4



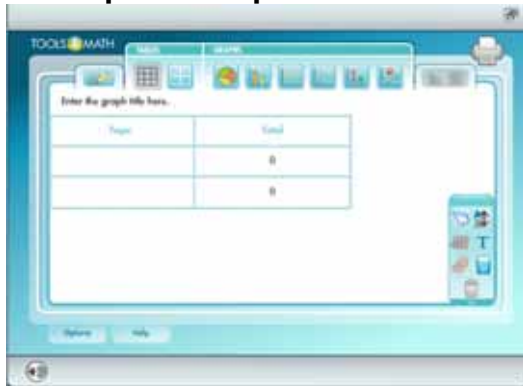
Step 5





Bar Graphs

Workspace: Graphs



Practice Using Bar Graphs

1. Select . Increase the number of rows to 5. Use to enter the graph title: Class Pets.
2. Enter the types of pets students have in the Topic column.

Select and click inside the first row.
Type the first kind of pet. Use dog.

Dog	8
Cat	6
Hamster	2
Fish	9
Bird	2

Type the remaining kinds of pets in rows 2-5. Use the data at the right.

3. Select . Change the interval to 1, the minimum to 0, and the maximum to 10. Click . Enter the data for the height of each bar in the right column. Select and click in the first row. Type the number. Use 8. Type the remaining numbers in rows 2-5. Use the data above.
4. Select and enter the y-axis label: Number of Students.
5. Now create a bar graph to match the data. Choose a color . Select . Click under the line for 8 in the dog column. Choose different colors and click on the graph for the remaining data. You can hide the Key Information box to view the bar graph.

Step by Step 33



Step 3



Step 5



Graphs

Create graphs and tables using data from a variety of sources. Solve for mean, median, mode, and range.

Circle Graphs

Choose the best type of graph for data entered in the table. Circle and line graphs are two choices.

Workspace: Graphs



Practice Using Circle Graphs

1. Select . Increase the number of rows to 4. Use to enter the graph title: Allowance Spent in One Month.
2. Enter data that will label each section of the graph in the Topic column.

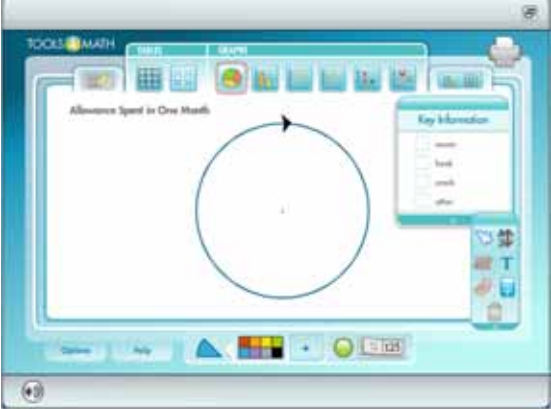
Select and click inside the first row.
Type the first expense. Use movie.



Type the remaining expenses in rows 2-4.
Use the data at the right. Type the numbers that represent the prices for each expense in the Total column.

Expense	Price
movie	6
book	4
snack	3
other	7

3. Click . Click so that value is selected.

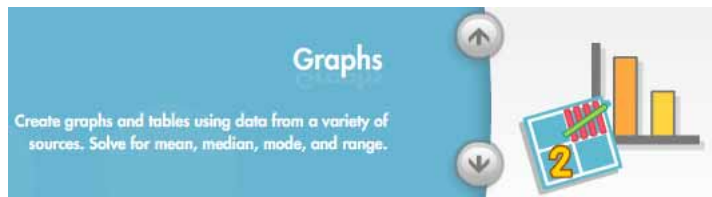
Step 3



4. Choose a color to represent movie. Drag the black arrow until the value displayed is 4. Click  to add this section to the graph. Change to color and continue adding sections to the graph for the remaining expenses.
5. You can click  to change the numbers displayed when you move the mouse over each section to percentages.

Step 5





Line Graphs

You can choose the best type of graph for data entered in the table. When you want to compare data over time, use a line graph.

Workspace: Graphs



Practice Using Line Graphs

1. Select . Increase the number of rows to 5. Use to enter the graph title: Average Monthly Temperatures.
2. Enter data that will label each point on the line graph in the Topic column.

Select and click inside the first row.
Type the first month. Use May.

May	62
June	73
July	85
August	90
September	78

Type the remaining months in rows 2-5.
Use the data at the right.

3. Select . Change the interval to 10, the minimum to 0, and the maximum to 100. Click .
Enter the data that will determine the direction of the line in the right column.

Select and click in the first row. Type the number. Use 62.
Type the remaining numbers in rows 2-5. Use the data above.

Step by Step 35


TOOLS 4 MATH

Step 3



4. Select **T** and enter the y-axis label: Degrees Fahrenheit.
5. Now create a line graph to match the data.

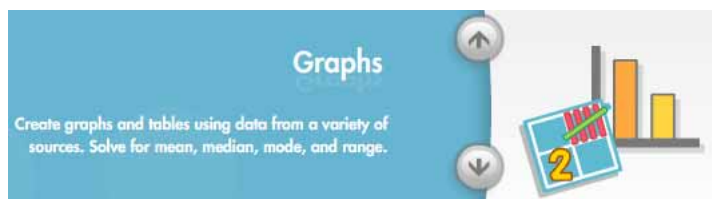
Start the graph by using  to place the first point at (0, 0).

Use  to place points on the graph at each month according to the table.

A line will connect the points to show trends in the data.

Step 5





Picture Graphs

You can choose the best type of graph for data entered in the table. When you want to see how many people chose different things, create a picture graph.

Workspace: Graphs



Practice Using Picture Graphs

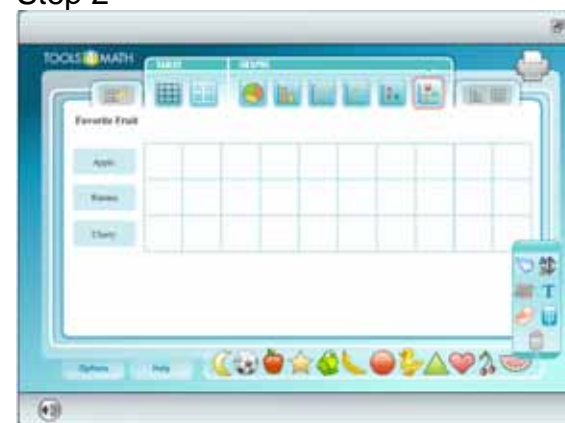
Mrs. Herndon's class took a survey to vote for their favorite fruit. Five students picked apple, two students picked banana, and seven students picked cherry. Make a picture graph to show this data.

1. Select . Increase the number of rows to 3.
2. Select . Use **T** to enter the graph title: Favorite Fruit.
Click **T** and then click inside the blue box. Enter Apple. Enter Banana and Cherry into the other rows of the graph.
3. Now fill in the pictures to represent the students who picked each fruit. Every picture stands for one student.
Click . Place one in each box in the apple row. Repeat for and .
4. Which fruit has the most votes?

Step by Step 36

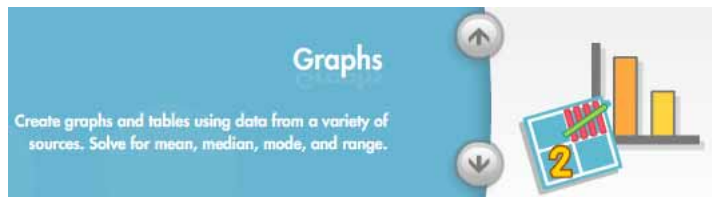
TOOLS 4 MATH

Step 2



Step 3







Coordinate Grids


In the coordinate plane workspace, the x-axis and y-axis intersect at the origin.

Workspace: Graphs



Use  to zoom in and  to zoom out.

Practice Using Coordinate Grids


1. Click  to select the Coordinate Graph workspace.
2. Graph the point (2,7).

Select  and click in the coordinate grid to place the point.

Click and hold at the origin (0,0), then move two spaces right and seven spaces up until the ordered pair next to the point says (2,7).

Release and note that the point is now labeled A.

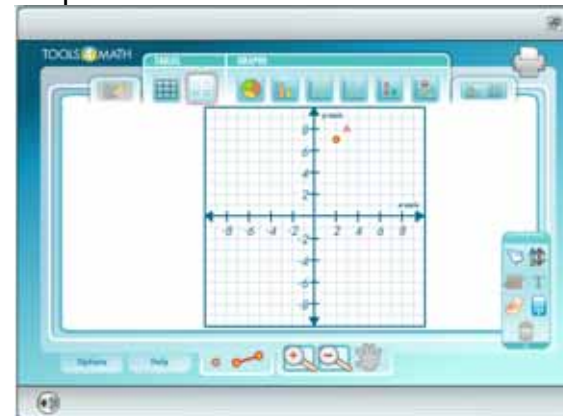
3. Graph the point (5, -4).

Click and hold  at the origin, then move five spaces right and four spaces down. Then release.


Step by Step 37




Step 2



4. Graph the point $(-6, 6)$.

Click and hold  at the origin, then move six spaces left and six spaces up. Then release.

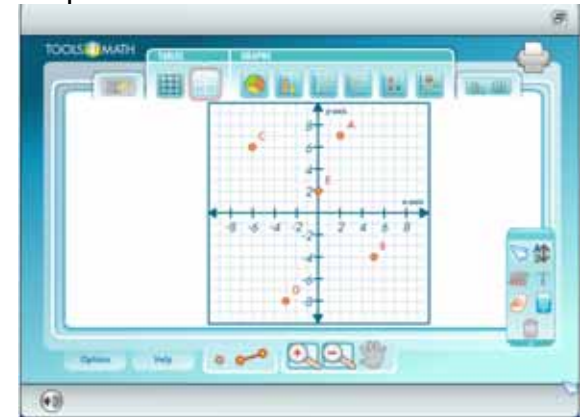
5. Graph the point $(-3, -8)$.

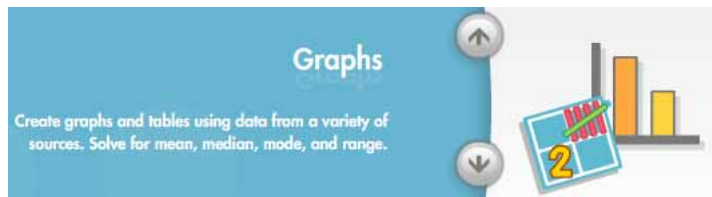
Click and hold  at the origin, then move three spaces left and 8 spaces down. Then release.

6. Graph the point $(0, 2)$.

Click and hold  at the origin, then move two spaces up.

Step 6





Line Plots

Workspace: Graphs



Practice Using Line Plots

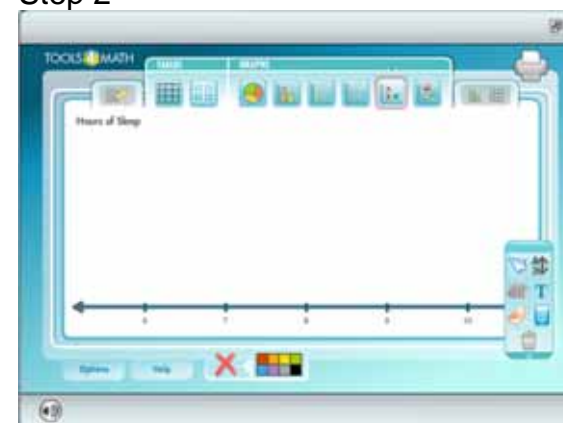
1. Click and increase the number of rows to 5.
2. Click . Create a line plot to represent a survey of how many hours students sleep each night.
Use to enter the graph title: Hours of Sleep
Use to enter the number of hours of sleep under each point on the number line. Use the data at the right.
3. Fill in the graph for the data in the table.
Select a color and click .
Click in the white space directly above the number 6 to place the X on the graph.
Continue to place icons on the graph according to the data table.

Hours	Frequency
6	1
7	1
8	5
9	5
10	3

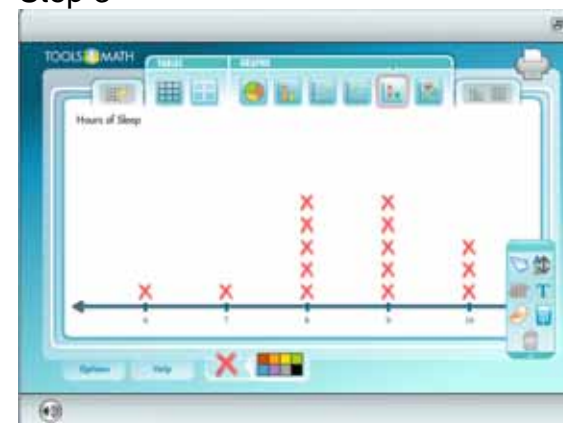
Step by Step 38

TOOLS 4 MATH

Step 2



Step 3





Basic Shapes

Nine basic geometric shapes are included in the Shapes menu.

Workspace: Shapes Workspace



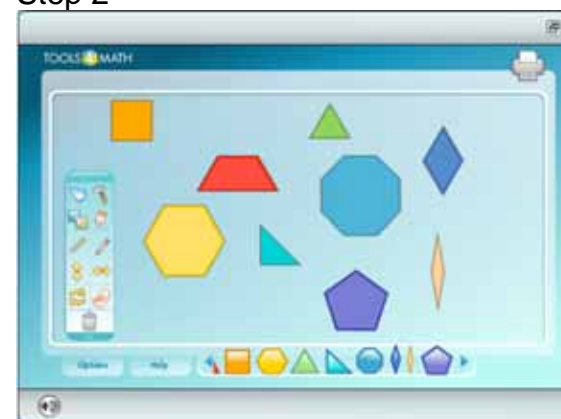
Practice Using Geometry Shapes

1. Place a shape in the workspace. Use a square.
Click . The cursor becomes the shape of a square.
Move the cursor to the location in the workspace where you want to place the square and click.
2. Place one of all the other shapes in the workspace.
Use the same procedure as you did in Step 1.
3. Classify and organize the shapes. Form groups of triangles, quadrilaterals, and other polygons.
Use to select and reposition the shapes in the workspace.
Move both triangles to a row along the top of the workspace.
Move the quadrilaterals to a row in the middle of the workspace.
Move the other polygons to a row along the bottom of the workspace.
4. You can also rotate a shape horizontally or vertically.
Select and click on a shape to rotate it vertically.
Select and click on a shape to rotate it horizontally.

Step by Step 39

TOOLS 4 MATH

Step 2



Step 3





Slides and Flips

You can show slides and flips of the nine basic geometric shapes.

Workspace: Shapes Workspace



Practice Using Geometry Shapes

1. Place a shape in the workspace. Use a hexagon.
Click . Move the cursor to the location in the workspace where you want to place a hexagon and click.
2. Place slide images of your hexagon in the workspace.
Begin with the cursor over your newly placed hexagon. Slide the cursor directly to the right. Click to place a second hexagon.
Slide the cursor down and click to place another hexagon. Place two more hexagons, one to the upper right and the other down, to the left.
3. Click . Click to clear the workspace.
4. Place a shape in the workspace. Use a right triangle.
Click on . Move the cursor to the location in the workspace where you want to place the right triangle and click. Place another right triangle.
5. Flip each of the right triangles, one horizontally, one vertically.
Click on one right triangle. The triangle is flipped over a horizontal line of reflection. Click on the other right triangle. The triangle is flipped over a vertical line of reflection.

Step by Step 40

TOOLS 4 MATH

Step 2



Step 5





Turns

You can show slides and flips of eight basic geometric shapes.

Step by Step 41

TOOLS **4** MATH

Workspace: Shapes Workspace




Practice Using Geometry Shapes


1. Place a shape in the workspace. Use a narrow rhombus.

Click .

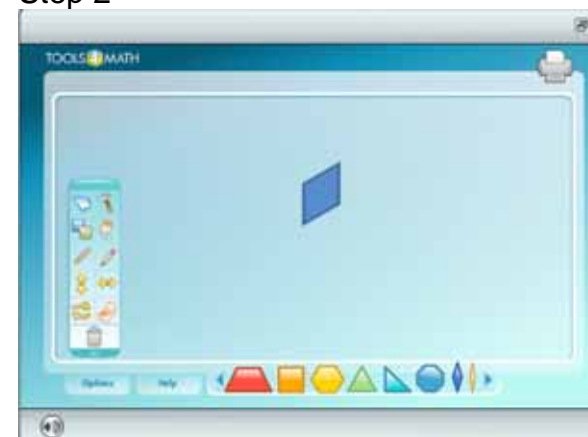
Move the cursor to the location in the workspace where you want to place the rhombus and click.

2. Turn the rhombus.

Click . Click and hold the rhombus. Notice it turns in whichever direction you choose. Return the rhombus to its original position.

3. Add another rhombus to the workspace. Use  to rotate the rhombus 180° counterclockwise (from its original position). Notice the original rhombus and the rhombus that has been rotated 180° look identical.

Step 2



Step 3





Making New Shapes

You can use multiple shapes combined with slides, flips, and turns to make new shapes.

Workspace: Shapes Workspace




Practice Using Geometry Shapes


1. Create a rectangle that is not a square.

Click . Click in the workspace to place a square.

Move the cursor to the right. Click again to place a second square.


Use  to select and reposition the square so that they are next to each other and appear to be one rectangle.

2. Create an isosceles triangle that is not an equilateral triangle.

Click . Click on an open location in the workspace.

Move the cursor to the right. Click again to place a second triangle.

Click . Click one right triangle. The triangle is flipped.

Use  to select and reposition the right triangles so that they are next to each other and appear to be one isosceles triangle.


Step by Step 42

TOOLS  MATH


Step 2





3. Create an irregular pentagon.



Click . Click on an open location in the workspace.

Move the cursor to the right. Click again to place a second triangle. Repeat to place a third and fourth triangle.

Click . Click on one triangle to flip it.

Use  to select and reposition the triangles so that three are next to each other and one is on top. They appear to be one larger equilateral triangle.

Click . Move the cursor near the triangle and click.

Click . Click and hold on the trapezoid. Turn it until the long side is parallel to the side of the triangle. Use  to select and reposition the trapezoid so that it is next to the triangles and forms a pentagon.

Step 3





Using a Mirror

In the Reflection workspace, see shapes reflected across a vertical line.

Workspace: Reflection Workspace



Practice Using Geometry Shapes

1. Select the Reflection workspace.
2. Investigate how the distance between a shape and a line of reflection impacts the position of the mirrored image. Use a trapezoid.

Click . Click to place a trapezoid in the upper left side of the workspace. Notice the distance from the line of reflection to the original shape is equal to the distance from the line of reflection to the mirror image.

Place a second trapezoid in the left section of the workspace, next to the line of reflection. Notice the distance from the line of reflection to the original shape is equal to the distance from the line of reflection to the mirror image.

3. Clear the workspace with . Click .

4. Create a design. Use an equilateral triangle.

Click . Click in the upper left section of the workspace.

Move down and to the right and place another triangle. Repeat two more times.

Click the lower left section of the workspace.

Move up and to the right and place another triangle. Repeat two more times.

Click on each of the 4 lower triangles.

Step by Step 43

TOOLS 4 MATH

Step 2



Step 2





Making a Pattern

You can use the Spaces workspace to create designs and tessellations.

Workspace: Shapes Workspace



Practice Using Geometry Shapes

1. Choose several shapes and colors to create a design. Place all of the shapes in this step in the lower half of the workspace, disregarding position.

Click . Click to place four equilateral triangles.

Click . Click on two triangles to flip them.

Click . Click to place two hexagons in the workspace.

Click . Click to place six rhombuses in the workspace.

2. Create a design using the shapes from Step 1. Use to select and reposition the shapes to make a pattern. A possible design is shown.

3. Extend the design.

Click . Place two equilateral triangles in the pattern.

Click . Place two equilateral triangles in the workspace. Use to flip them. Then use to select and reposition the triangles in place in the pattern.

Click . Place two hexagons in the pattern design.

Click . Place blue rhombuses in the pattern design.

Step by Step 44

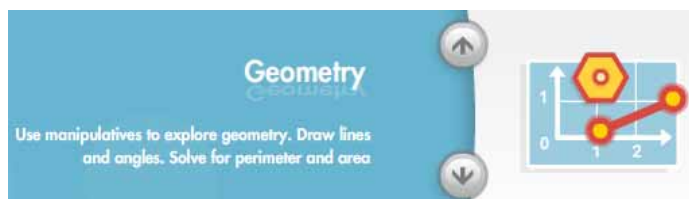


Step 2



Step 3





Drawing Geometry Basics

You can draw a point, segment, ray, line, angle, and many polygons.

Workspace: Geometry and Shapes on a Grid Workspace



Practice Using Geometry

1. Draw a point. Click . Place the pencil in the workspace and click.
2. Draw a segment. Click . Place the pencil in the workspace and click. Use to move the second endpoint.
3. Draw a ray.
Click . Click in the workspace to create an angle. Click in the workspace to create a ray. Click on the second point of the ray to change the direction.
4. Draw an angle.
Click . Click in the workspace to create an angle. Click and drag points on the sides of the angles to adjust the size of the angle.
In the options menu, select the Shapes on a Grid Workspace.
5. Draw a regular polygon.
Click . Click the workspace to create the center point of the triangle. Using the , click and hold one of the vertices to increase the size, and then release. Select another regular polygon or a circle. Create it in the workspace.
6. Draw a non-regular polygon.
Click . Click each place you want a vertex. Click on the first point again to close the polygon.

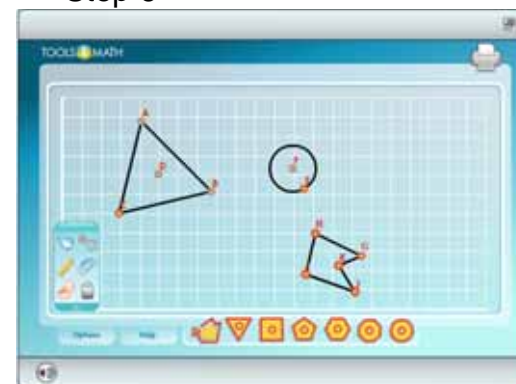
Step by Step 45

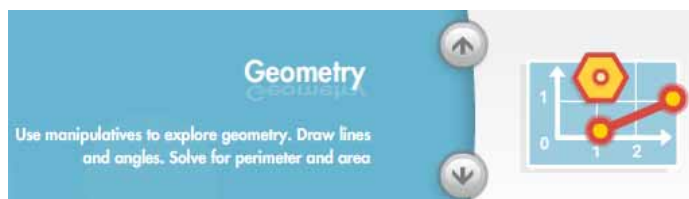
TOOLS MATH

Step 4



Step 6



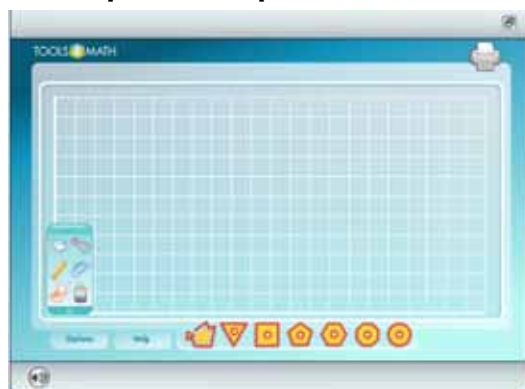


Perimeter

Step by Step 46

TOOLS 4 MATH

Workspace: Shapes on a Grid Workspace



Practice Finding Perimeter

1. Draw a regular hexagon and an irregular pentagon.

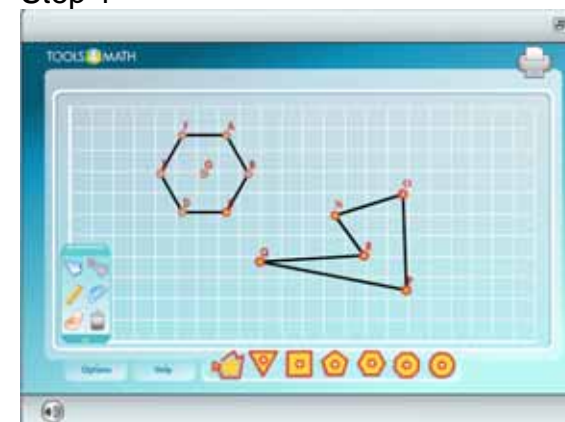
Select . Click in the workspace to create the center point. Use . Click and hold one of the vertices and drag to change the size of the hexagon, and then release.

Click . Click in the workspace to create the first point. Move the cursor, and click to place the second point. Move the cursor, and then click again. Repeat two more times, and click again on the first point to form the irregular pentagon.

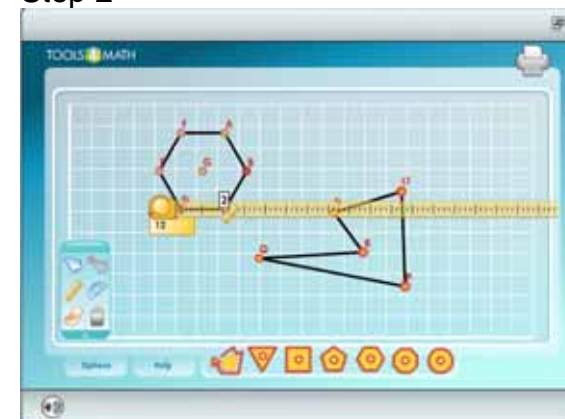
2. Measure the perimeter of the hexagon, and the pentagon.

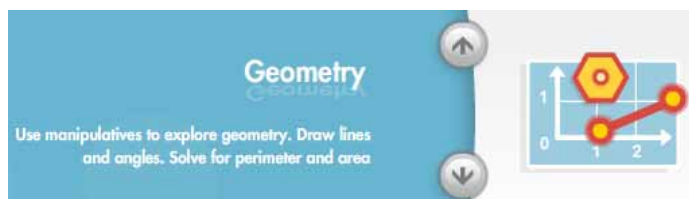
Click . Double click on any vertex of the hexagon and align the ruler with one side of the hexagon. Click again on the ruler to secure its position. Move the mouse over the vertex the ruler overlaps and the length of the side will appear. Multiply this length by six to find the perimeter. Repeat this process for the pentagon, but measure each of the five side lengths and then add them together to find the perimeter.

Step 1



Step 2





Finding Distance and Degrees

You can find the distance between two points and the measure of an angle.

Workspace: Points and Lines on a Grid



Practice Using Geometry Drawing

- Place two points on the grid.
Click . Place the pencil on the grid and click to create Point A. Click again to create Point B.
- Measure the distance from Point A and Point B.
Click . The cursor becomes a ruler.
Position the target over Point A and double click.
Align the ruler with point B and double click to secure its position.
Move the mouse over Point B to find the distance between Point A and Point B.
- Draw and measure an angle.
Select . Click in the workspace to place the angle, and drag the points on the sides of the angle to change its size.
Select and click on the vertex. Click and hold to align 0° on the right side of the protractor with the lower ray. Release to secure its position. Move the mouse to the point where the other ray intersects the protractor and read the number on the same arc as the 0°. This is the measure of the angle.

Step by Step 47

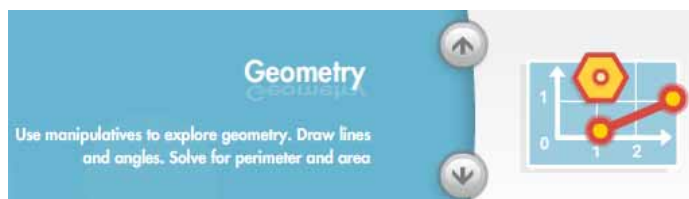
TOOLS 4 MATH

Step 2



Step 3









Modeling Polygons

You can use the Geoboard workspace to model polygons.

Workspace: Geoboard



Practice Using the Geoboard

1. Create a triangle in the workspace.
Choose a line thickness. Use thick lines.
Click on the workspace. Line segment AB will appear.
Use  and click on the segment between A and B. Point C will appear.
Choose the  tool, then click and drag point C down. Release and you have a triangle.
2. Use  to clear the workspace. Click .
3. Create a rectangle in the workspace.
Choose a line thickness. Use thin lines.
Click on the workspace. Line segment AB will appear.
Use  and click on the segment between A and B.
Point C will appear. Click again to create point D.
Drag points C and D down so they are directly below points A and B respectively.
You now have a rectangle.

Step by Step 48

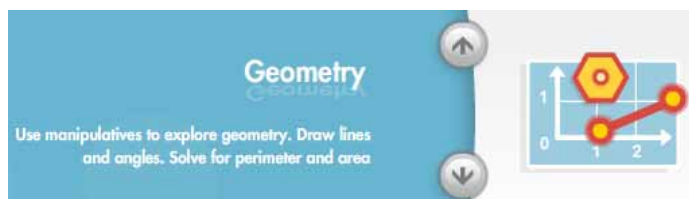


Step 1



Step 3





Drawing Lines


You can draw different kinds of lines with Geometry Drawing.


Workspace: Geometry




Practice Using Geometry Drawing


1. Draw a pair of parallel lines.


Select  and click in the workspace. You will see a thick black line with two labeled points and a thin gray line with one labeled point.

Click  and hold the point on the gray line. You can move one line closer to or further away from the other, but they will always remain parallel.

Click and hold one of the points on the black line. You can change the direction of one line, and the other line will automatically move to stay parallel.

2. Clear the workspace with . Click
3. Now draw a pair of perpendicular lines.

Select  and click in the workspace. You will see a thick black line with two labeled points and a thin gray line with one labeled point.

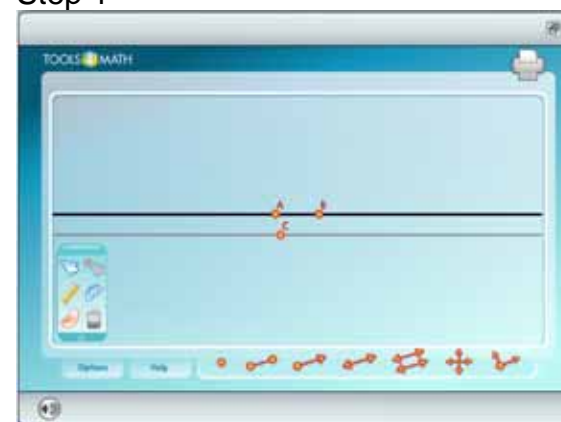
Click  and hold the point on the gray line. You can move one line from side to side, but it will always remain perpendicular to the other line.

Click and hold one of the points on the black line. You can change the direction of one line, and the other line will remain perpendicular to it.

Step by Step 49

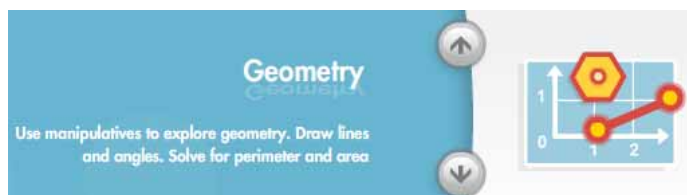
TOOLS  MATH

Step 1



Step 3





Measuring Circles

Step by Step 50

TOOLS 4 MATH

Workspace: Shapes on a Grid



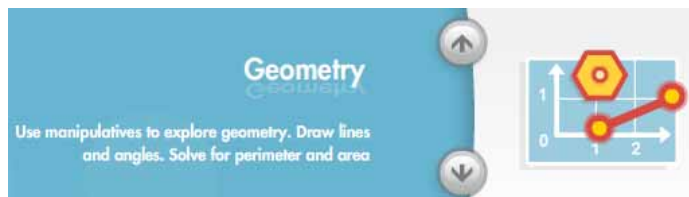
Practice Measuring Circles

1. Create a circle.
Use and click on . Click in the workspace.
2. Select . Then click and drag the labeled point away from the center of the circle to increase its size.
3. Measure the radius of the circle.
Click and click once to place the ruler on the center of the circle.
Click at the end of the ruler to extend the ruler. Align the ruler with the point on the circle. Click once more to keep the ruler in place.
Move the mouse over the point where the ruler intersects the circle. Click on the point and a number will appear under the ruler. This is the radius.
4. Using the radius you can calculate the circumference of the circle.
$$\text{Circumference} = 2 \times \pi \times \text{radius}$$

Use 3.14 for pi.
5. Create another circle of a different size.
6. Measure the radius of the second circle and calculate the circumference.

Step 3





Intersecting Lines





Step by Step 51


TOOLS 4 MATH

Workspace: Geometry or Points and Lines on a Grid




Practice Using Intersecting Lines

1. Use  to select  and click in the workspace.
2. Click again below the first line.
3. Use  to click and drag point B below line CD so that line AB intersects line CD between points C and D .
4. Select  and click where the two lines intersect. Point E will appear.
5. Measure the four angles created by two intersecting lines.

Select  and click on point E .

First measure angle CEA . The angle measure can be found by reading the protractor where it intersects line AB .

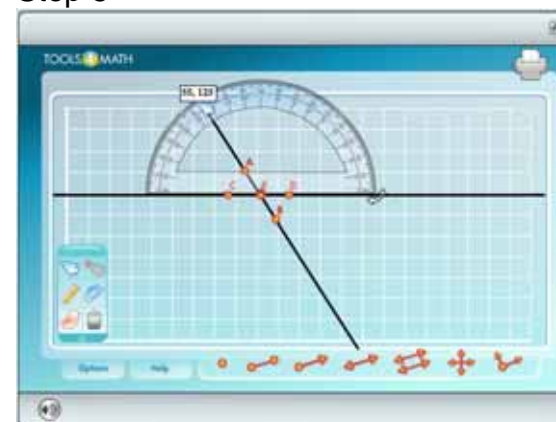
Click and hold  to align the protractor with the remaining angles, and measure each.

6. Which angles are obtuse? Which angles are acute?

Step 3



Step 5






Measuring with Non-standard Units

Measure an object using the non-standard units of snap cubes or paperclips.

Workspace: Length





Use  to measure using unit snap cubes.


Use  to measure using paper clips.


Measure Length Using Snap Cubes

1. Click one of the 14 objects to place an item on the workspace to measure.

To place the banana on the workspace, click .

2. Click  to place a cube chain in the workspace.
3. Click and hold the cube to align it with one end of the banana. Release, and the chain will extend. Align the other end of the cube chain with the other end of the banana and click again to secure its position.

If you turn on the tabulator  and click on the cube at the end of the banana, the length of the cube chain will appear in the tabulator. The banana is 6 cubes long.

4. Measure the length of  using snap cubes.


Step by Step 52






Step 3



Measure Length Using Paper Clips

5. Click  to clear your workspace.
Then click an object to measure.

To place the carrot in the workspace, click .

6. Click  to place a paper clip chain in the workspace.
7. Extend and align the paper clip chain with the carrot.
Read the length in the tabulator. The carrot is 4 paper clips long.
8. Measure the length of the  using paper clips.

Step 7






Measuring Length and Width



A drawing on paper has two dimensions, length, and width.

Workspace: Length



Use  to measure using a ruler.

Measure to the Nearest Whole Unit

- Click one of the 14 objects to place an item on the workspace to measure.
To place the notebook on the workspace, click .
- Select . Measure the book in inches.
Click and drag the ruler. Place it along the bottom of the notebook so that the left edge of the ruler is lined up with the left edge of the notebook. Click on the number closest to the edge of the notebook. The tabulator shows the bottom of the notebook is 4 inches long.
- Click and drag the ruler to the right side of the notebook and rotate it vertically. Now measure the notebook's other dimension (which is its height).
- You can measure with the ruler by placing it anywhere along the object. Suppose you lined up the left edge of the notebook up with the 2-inch mark. Note the unit on the ruler that is at the other edge of the notebook. The notebook lines up close to the 8-inch mark.
- The width is the difference in the inches. $8 \text{ inches} - 2 \text{ inches} = 6 \text{ inches}$.

Step by Step 53

TOOLS 4 MATH

Step 3



Step 4





More Precise Measuring

You can get a more precise measurement when you use a ruler that is marked with fractional units.

Workspace: Length




In the options menu, select ruler units from the following: ones, halves, fourths, or eighths.

Measure to the Nearest Half

1. In the options menu, select halves as the ruler unit. Click one of the 14 objects to place an item in the workspace to measure.

To place the eggplant on the workspace, click



2. Choose  and click in the workspace.
3. Measure the length of the eggplant.
Line up the zero on the ruler at one of the ends of the eggplant.
4. When the ruler is lined up along the eggplant, you can read the length of the eggplant on the tabulator. The precision in the tabulator will be the same as the precision in the ruler.

Step by Step 54



Step 3



Measure to the Nearest Fourth

5. In the options menu, select fourths as the ruler unit.
6. Select a different object, and measure it.
7. You can also repeat the activity using ruler divisions of eighths.

Measure to the Nearest Eighth

8. In the options menu, select eighths as the ruler unit.
9. Place the milk carton and the ruler in the workspace.
10. Measure the length of the milk carton.
The top of the carton is at the 7.25 inch mark.
The bottom of the carton is closest to the one inch mark.
11. Subtract to find the length. $7.25 \text{ inches} - 1 \text{ inch} = 6.25 \text{ inches}$.

Step 10





Customary Capacity

You can fill a container to find equivalent measures.



Workspace: Capacity Gallon and Cup Workspace




In the options menu, choose between customary or metric containers. Select a size for the target container. The customary options are gallon, half gallon, quart, and cup.

How many quarts equal 1 gallon?

1. In the options menu, select a 1-gallon container for the target container.

2. Select  and click  to fill the container with 1 quart of liquid.

3. Fill the container to the top.

Click  to add another quart of liquid to the container.

Continue to quarts of liquid until the container is full.

4. Use the tabulator to find the number of quarts in a gallon.

You poured 1 quart into the target container 4 times.

Multiply. $1 \text{ qt} \times 4 = 4 \text{ qt}$, so $4 \text{ qt} = 1 \text{ gal}$



Step by Step 55



Step 2



How many tablespoons equal 1 cup?

5. In the options menu, select a cup for the target container.
6. Click  to fill the container with one tablespoon of liquid.
7. Fill the container to the top.
Click  to add one tablespoon of liquid until the container is full.
8. Use the tabulator to find the number of tablespoons in a cup.
You added one tablespoon to the container sixteen times.
Multiply. $1 \text{ tbsp} \times 16 = 16 \text{ tbsp}$, so $16 \text{ tbsp} = 1 \text{ c}$.

Step 7

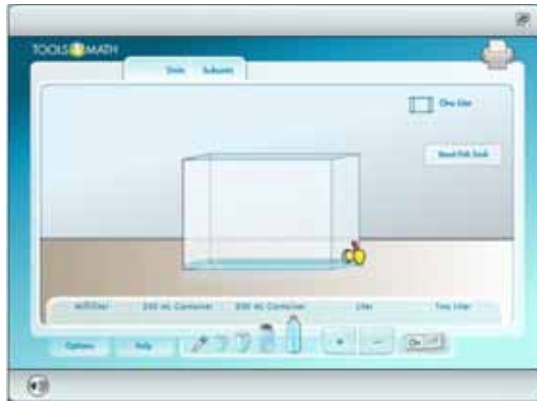




Metric Capacity




You can fill a container to find equivalent measures.

Workspace: Capacity Liter Workspace



In the options menu, choose between customary or metric containers. Select a size for the target container. The metric options are one liter or two liters.

How many milliliters equal 1 liter?

1. In the options menu, select a liter container as the target container.
2. Select  and click  to fill container with 250 milliliters of liquid.
3. Fill the container to the top.
Click  to add another 250 milliliters of liquid to the container.
Continue to add 250 milliliters of liquid until the container is full.
4. Use the tabulator to find the number of milliliters in a liter.
You poured 250 milliliters into the container 4 times.
Multiply. $250 \text{ mL} \times 4 = 1,000 \text{ mL} = 1 \text{ L}$.

Step by Step 56



Step 3

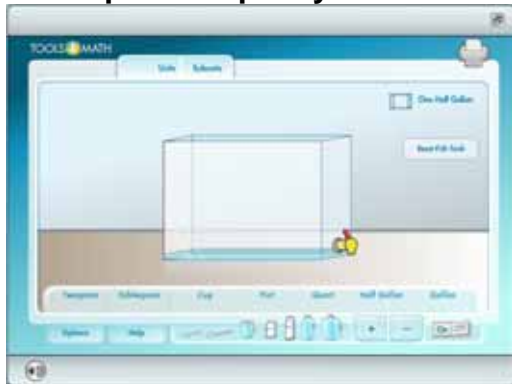




Filling a Container

Investigate to find what amounts of liquid can be combined to fill a container.

Workspace: Capacity Half Gallon Workspace





In the options menu, choose between customary or metric containers.

Select a size for the target container. The customary options are gallon, half gallon, quart, and cup.



Filling a Quart Container

A chef has four containers of soup that he wants to combine into a $\frac{1}{2}$ gallon container. Can he pour 1 quart, 1 pint, 1 cup, and 10 tablespoons into a $\frac{1}{2}$ gallon container? If not, how much will be left over?



1. In the options menu, select half gallon as the target container.
2. Add 1 quart.

Select  and click  to fill the container with 1 quart of liquid.

3. Add 1 pint.

Select  and click  to add 1 pint of liquid to the container.

4. Add 1 cup.

Select  and click  to add 1 cup of liquid to the container.

5. Add 10 tablespoons.

Select  and click  to add 1 tablespoon. Click ten times, or as many times as you can until the container is full.

6. Read the tabulator to see how many of these different amounts fit into the half gallon container.

Step by Step 57



Step 3



Step 5





Fractional Parts of a Gallon

You can use the marks on a container to relate units to each other.


Workspace: Capacity Gallon Workspace




In the options menu, choose between customary or metric containers.



Select a size for the target container. The customary options are gallon, half gallon, quart, and cup.


1. In the options menu, select a gallon container as the target container.
2. Fill the container using any of the pour containers.
3. Check the different ways you can mark the container.

Use the Units/Subunits menu  above the workspace to select markings of ones, halves, thirds, fourths, eighths, or tenths on the target container.

What part a gallon is two quarts?

4. Click  to clear your workspace.
5. Pour 2 quarts into this container.

Select  and click  to pour 1 quart of liquid into the container. Click to add another quart to the container.

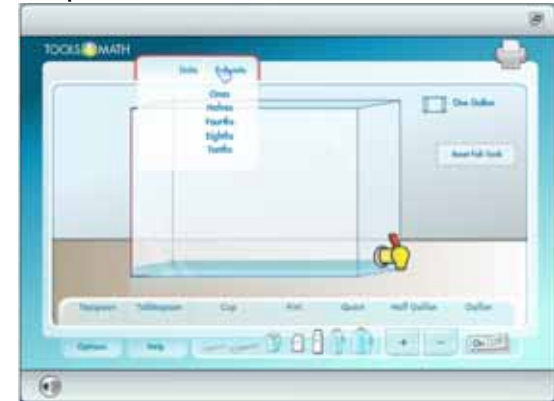
6. Click  and select halves from the drop down menu. Notice that the half-mark lines up with the level of the liquid in the container.

$$2 \text{ quarts} = \frac{1}{2} \text{ gallon.}$$

Step by Step 58





Step 3





Step 6



What unit equals one-eighth of a gallon?

7. Click  to clear your workspace.
8. Click  and select eighths from the drop down menu.
9. Fill the container so the level of the liquid lines up with the first mark on the container.

Select  and click  to add one pint of liquid to the container.

1 pint = $\frac{1}{8}$ of a gallon.

Step 9





Weight and Mass

Step by Step 59



Workspace: One and Two Scale Grocery Store Workspace



Practice Using Mass

1. Measure the mass of an apple and a head of lettuce in grams.

Use to choose and click on the scale to place it in the workspace.
Click twice to see the mass of an apple in grams.

Use to remove the apple from the workspace.

Click and choose . Then click on the scale to place it in the workspace.
The scale shows the mass in grams.

2. In the options menu, select the two-scale grocery store workspace.
3. Compare the mass of a watermelon and broccoli in kilograms.

Use to choose and click on the left scale to place it in the workspace.

Select and click on the right scale.
Click on each scale three times to display the mass in kilograms.
Which food has a greater mass?

Step 1



Step 3







Boiling and Freezing




You can use the thermometer to show the boiling and freezing points of water in $^{\circ}\text{F}$ and $^{\circ}\text{C}$.

Workspace: Temperature



Use  or  to move the temperature up or down.

Measuring the Boiling and Freezing Points of Water

1. In the options menu, set your workspace to show a thermometer for $^{\circ}\text{F}$ only.
2. Click  to raise the temperature until the water boils. You can click and hold on the increase button. You will notice the water bubbling when it begins to boil. Read the number of degrees in the tabulator. Water boils at 212°F .
3. In the options menu, set your workspace to show a thermometer for $^{\circ}\text{C}$ only.
4. Click  to raise the temperature until the water boils. The tabulator will read 100°C when the water is boiling.
5. In the options menu, choose a thermometer to show both $^{\circ}\text{F}$ and $^{\circ}\text{C}$. Find the $^{\circ}\text{F}$ and $^{\circ}\text{C}$ at which water freezes.
6. Repeat the steps for boiling water. This time click  to lower the temperature until the water freezes. Water freezes at 32°F and at 0°C .

Step by Step 60

TOOLS  MATH

Step 2



Step 6





Comparing Temperatures

You can compare temperatures by finding the difference between a starting temperature and an ending temperature

Workspace: Temperature Two Beakers





Difference in Temperatures

The warmest month in New York City is July, with an average high temperature of 86°F. The city's coldest month is January, with an average low temperature of 32°F. What is the average change in temperature from the warmest month to the coldest month?

1. In the options menu, set your workspace to show a thermometer with both a °F scale and a °C scale.



2. Use  and  to change the temperature in the left beaker to 86°F.
3. Change the temperature in the right beaker to 32°F.
4. Calculate the difference between the two temperatures. $86^{\circ}\text{F} - 32^{\circ}\text{F} = 54^{\circ}\text{F}$.

Step by Step 61

TOOLS  MATH

Step 2



Step 3

